U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-274 649

Air Quality Monitoring in Little Rock, Arkansas

Radian Corp, Austin, Tex

Prepared for

Environmental Protection Agency, Dallas, Tex Region VI

Nov 77

PB 274 649
EPA 906/9-77-006

AIR QUALITY MONITORING IN LITTLE ROCK, ARKANSAS

NOVEMBER, 1977
FINAL REPORT

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75201

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 906/9-77-005	2.
3. RECIPIENT'S ACCESSION NO. PB274649	
4. TITLE AND SUBTITLE: Air Quality Monitoring in Little Rock, Arkansas	5. REPORT DATE: November, 1977
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S): Radian Corporation	8. PERFORMING ORGANIZATION REPORT NO.: DCN 77-100-178-03
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Radian Corporation, P. O. Box 9948, Austin, Texas 78766	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO.: Contract No. 68-02-2538, Task Order No. 1
12. SPONSORING AGENCY NAME AND ADDRESS: U. S. Environmental Protection Agency, Region VI, 1201 Elm Street, Dallas, Texas 75270	13. TYPE OF REPORT AND PERIOD COVERED: Final
	14. SPONSORING AGENCY CODE: 906/09

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Ambient air quality data for the Little Rock, Arkansas metropolitan area were collected and compiled for a sixty-day period in 1977. The ambient concentrations of ozone and oxides of nitrogen were collected on a time-specific basis.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Ambient air quality monitoring Ozone Nitrogen oxides Little Rock, Arkansas		

18. DISTRIBUTION STATEMENT: Release Unlimited	19. SECURITY CLASS *(This Report)*: Unclassified	21. NO. OF PAGES: 56
	20. SECURITY CLASS *(This page)*: Unclassified	22. PRICE: A04-A01

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

906/9-77-006

AIR QUALITY MONITORING IN LITTLE ROCK, ARKANSAS

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Contract No. 68-02-2538, Task Order No. 1

FINAL REPORT

Prepared for:

Environmental Protection Agency
Region VI
Surveillance and Analysis Division
Dallas, Texas 75270

November, 1977

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This report was furnished to the Environmental Protection Agency by Radian Corporation, Austin, Texas in fulfillment of Contract No. 68-02-2538, Task Order No. 1. This report has been reviewed by Region VI, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Region VI Publication No. 906/9-77-006

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1.0 INTRODUCTION

The objective of this project was to collect and compile ambient air quality data for Little Rock, Arkansas and Shreveport, Louisiana. This study was conducted under Task Order No. 1 of Basic Ordering Agreement No. 68-02-2538. The data accumulated for Little Rock, Arkansas is the subject of this report.

One mobile monitoring station was located in the metropolitan area for sixty days to collect time-specific data on the ambient concentrations of ozone and oxides of nitrogen. The site was located at a municipal airport with National Weather Service facilities, and, therefore, separate meteorological monitoring was not needed. An intensive quality assurance program of calibrations, audits, and zero/span checks was included to verify the validity of the data.

This report presents the data accumulated in this study and describes the equipment and procedures used to obtain that data. Section 2 of this report describes the instruments, data system, and monitoring station. Section 3 describes the quality assurance procedures. Section 4 gives a brief description of each monitoring site. Section 5 summarizes and presents the data for each site including calibration results, audit results, and down time analyses. A valid data recovery of 99.8% was achieved for Little Rock monitoring.

2.0 INSTRUMENT SYSTEMS

This section discusses the major components of the monitoring station. The system consisted of air quality instrumentation and a computer-controlled data system housed in a twenty-six foot, fifth-wheel trailer. Figure 2-1 shows a typical configuration of the monitoring station. This station maintains a stable environment ($\pm$ 5°F) for the correct operation of all instruments. Meteorological instrumentation was not provided because the site was located at a municipal airport from which meteorological data are available.

2.1 Air Quality Instrumentation

The Meloy Laboratories Model OA350-2R Ozone Analyzer was used to measure ozone. This instrument continuously measures ozone by the chemiluminescent principle and is EPA-approved as an equivalent method for ozone. The instrument was operated on the approved range of 0-500 ppb.

The Meloy Laboratories Model NA520 Oxides of Nitrogen Analyzer was used to measure NO and NO_x. This instrument uses the chemiluminescent principle of analysis and has dual channels to continuously monitor the NO and NO_x. NO_2 is obtained by subtraction in the data system. The Model NA520 was operated on a 0-500 ppb range.

The air sample was drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system had a 25 mm diameter, and a constant air flow through the system was provided by an air pump rated at 60 cfm at 0" head pressure. The manifold had sampling ports to which ½" teflon lines to the instruments were connected. All joints in the sampling system

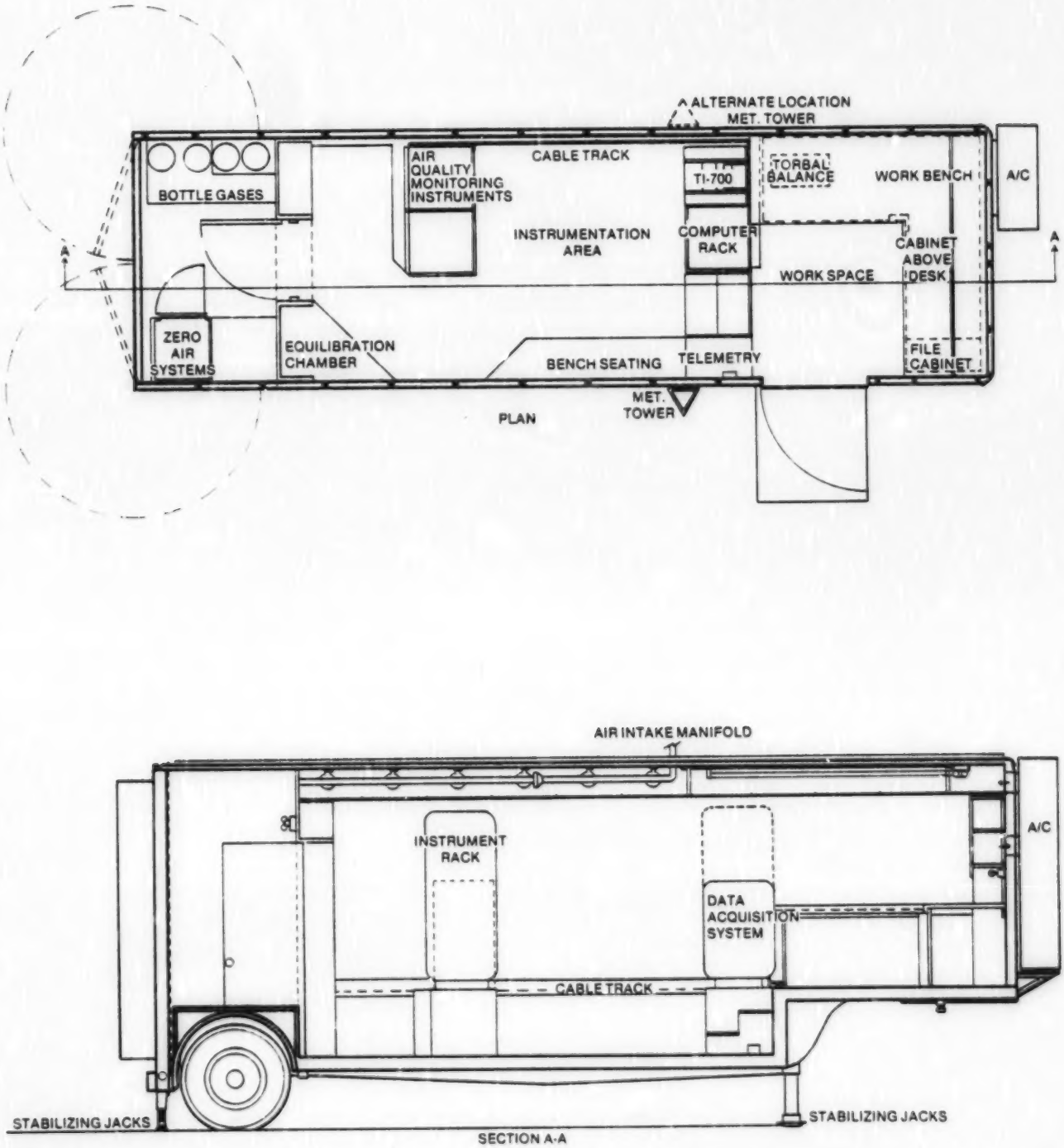

Figure 2-1. Typical Configuration of Monitoring Station

were secured by O-ring compression fittings. The manifold was contained in a heated (100°F) chamber to prevent condensation of moisture.

2.2 Calibration Equipment

A Meloy Laboratories Model CNS 1 calibrator was used for daily automatic zero/span checks on the NO_x analyzer. The ozone analyzer was equipped with an internal span service. A Bendix Model 8851 Dynamic Calibration System was used for multi-point calibrations of both analyzers. Two separate units were used for external audits, a Bendix Model 8861 D Transportable Field Calibration System and a Monitor Labs 8500 R calibrator. Calibration and audit procedures are described in detail in Section 3.

2.3 Data Acquisition System

The station was equipped with its own data acquisition system consisting of five major components.

1) Analog-to-Digital (A/D) System,

2) Data General NOVA 1200 Based Computer Unit and Memory,

3) Texas Instruments KSR-733 Keyboard/Printer,

4) Three Magnetic Tape Cassette Units, and

5) System Status Panel

The basis of the data acquisition system was a Data General NOVA 1200 minicomputer. The NOVA, with a basic cycle time of 1.2 μsec, was equipped with automatic program load and power fail/automatic restart features. The computer utilized 8K 16-bit words of core memory. Analog-to-digital conversion was accomplished via an ADC built by Radian Corporation. The input/output unit for the system was via a teletype keyboard/printer. This teletype provided keyboard entry and hardcopy printed output. The data were also recorded on a cassette magnetic tape unit with three drives. The cassette unit was utilized for program storage and loading as well as recording. The power to the teletype and cassette units was turned on only when the unit(s) was to be used to reduce wear on mechanical parts.

3.0 QUALITY ASSURANCE PROCEDURES

Many factors are important in the collection of acceptable air quality data. These include stable, well-maintained instruments, a suitable environment for those instruments, a well-designed sampling system that provides unaltered samples of the ambient air, reliable reference gases, detailed records of all activities, and proper operating procedures for the monitors. In addition, it is desirable to perform periodic calibrations and control-sample audits to assess the uncertainty in the ambient data.

The monitoring stations at Little Rock and Shreveport were subjected to a stringent quality assurance program in order to substantiate the validity of the data and to detect any possible errors. Emphasis was placed on multi-point calibrations, audits, and zero/span checks. The publication, Guidelines for Development of a Quality Assurance Program; Reference Method for Measurement of Photochemical Oxidants, EPA-73-028c, was used as a guideline.

Calibration, audit, and span values for ozone were based upon the neutral buffered potassium iodide (NBKI) method as written in the Federal Register, Volume 36, No. 84, Part II, April 30, 1971. This technique, although under intense scrutiny, is the reference method for calibrating ozone analyzers. However, the ozone sample values were also checked using both direct and reverse gas phase titrations to provide secondary documentation. Values presented in this report are based on NBKI results.

The NO_x analyzers were calibrated and audited by dilution of Standard Reference Material (SRM) cylinders of NO in nitrogen obtained from the National Bureau of Standards. The con-

verter efficiency was checked periodically by gas phase titration of NO with ozone. The results of external audit checks indicated that the converter efficiencies were greater than 96%. A commercial cylinder of NO in nitrogen, referenced to the SRM used for multi-point calibrations, was used as the source for daily span values.

The ozone and NO_x analyzers were multi-point calibrated prior to the initiation of valid data collection and again approximately 30 days after the initiation of the monitoring. After monitoring began, external audits were conducted on a weekly basis by both Radian and EPA personnel. For the external quality assurance audits, reagents, gases, glassware, calibration equipment, and personnel were all different than that involved in the multi-point calibration. In addition to the external audits, the instrument engineer responsible for the calibrations also performed random internal audits using the same equipment as that used for calibrations.

All instruments were automatically zeroed and spanned once each day by computer control. Each instrument was first switched to zero and a supply of zero air was introduced to the analyzers. The computer monitored the output of each channel and took a new zero reading after a stable zero signal had been reached. This zero reading was compared by the computer to the zero reading obtained 24 hours earlier. Next, span gas was supplied to each channel, and the computer decided when a stable span value had been reached. This value was recorded and compared to the previous day's value. The instruments were then returned to the monitor mode, and after two minutes the computer resumed data taking. If either the zero or span value drifted by more than 10 ppb, it was noted and recorded as an excess drift. The operator could then check the system to see if a problem was developing. There were no excessive analyzer drifts during the course of the study that affected the validity of the data.

In addition to the above features, the quality assurance program for this study also included the following features:

1) The inside station temperature was continuously monitored to insure that the instruments had a stable environment. If the interior temperature became too high, a related feature included an automatic shutdown of the system to protect the components. At no time during the course of the study did the temperature vary outside the limits for acceptable data.

2) Line voltage was continuously monitored to detect if there were any drops or surges that might affect instrument performance. Two power failures occurred during the study, but no other voltage problems occurred.

3) All flows were checked using either NBS-certified bubblemeters or mass flow controllers that had been referenced to NBS-certified bubblemeters.

4) The air sampling manifold was heated slightly to prevent water condensation. A high flow rate was maintained to minimize residence time. All system components were glass or Teflon.

5) A sensor was mounted in the sample line to signal the computer if the manifold fan malfunctioned. No malfunctions occurred.

6) Both stations were visited daily by trained personnel.

7) Detailed logbooks were maintained in each station.

8) A detailed checklist was completed daily at the station to assure proper operation of the system.

9) A hardcopy printout of all data (including automatic zero/spans) was provided hourly at each station. Data were checked daily for indications of problems.

10) The data acquisition system was totally automated to eliminate human errors.

11) The discrimination of the data acquisition system exceeded that of the analyzers.

12) The computer was equipped with automatic restart after power failures. The analyzers also restarted automatically. The time and duration of the power failure were recorded and printed on the hard copy. Two power failures occurred at Little Rock.

13) Statistical significance of the data was assured by sampling all data channels once per second. Five-minute averages were calculated and stored.

14) The computer monitored and controlled many parts of the system. Problems were indicated visually by lights in the System Status Panel and by the hardcopy printout. All problem indications were also recorded on cassette tapes. Examples of monitored parameters include:
   (a) excess zero drift
   (b) excess span drift
   (c) shelter temperature
   (d) line voltage
   (e) manifold fan operation
   (f) manifold temperature
   (g) instrument power.

15) Data were recorded on two independent cassette tapes and hardcopy.

The purpose of these quality assurance features was to produce and substantiate valid data. The primary means for validating data were the calibration and audit results. For ozone data to be considered acceptable, it had to be bracketed with a multi-point calibration and subsequent quality assurance audits with the audit results being within $\pm$ 15 percent of the control-sample value. For oxides of nitrogen data to be considered acceptable, audit results had to be within $\pm$ 20 percent of the control-sample value. These specific percentage values for valid data were established by EPA.

In addition to the audit results, decisions were also based upon the results contained in the daily checklists, station logs, and additional monitored parameters such as inside temperature and line voltage. EPA-approved instruments are to be operated in a 20°C-30°C (68°F-86°F) temperature range to meet

certification standards. In this study data would have been deleted if the inside station temperature varied outside these limits, although there may have been no apparent inaccuracies in the data. However, the station temperature at Little Rock remained within these limits for the duration of monitoring.

4.0 SITE DESCRIPTION

The station for the Little Rock metropolitan area was located at the North Little Rock Municipal Airport on the northwest corner of the city of North Little Rock. The location of the station with respect to the Little Rock metropolitan area is shown in Figure 4-1.

The Little Rock monitoring station was approximately three-tenths of a mile south of the main portion of the airport and approximately one-tenth of a mile east of Remount Road. The station was located on an isolated asphalt pad on top of a gently sloping hill. The land around the station was covered by thick grass and weeds. The closest trees were approximately three hundred feet east of the site with another group about 500 feet to the south. Adjacent to the monitoring station was a shelter being prepared by the state of Arkansas for use as a monitoring station.

The location of the monitoring station gave good exposure in all directions. There were no obstructions to airflow that might affect monitoring results. There were few nearby sources of pollution for this site. Automotive traffic on Remount Road and air traffic at the airport were generally light. There was no heavy industry near the monitoring site, and, although located on the edge of the metropolitan area, the site was rural in nature. Camp Robinson maintained by the Arkansas National Guard was west and northwest of the site. The nearest housing development was about one-half mile southeast of the site and had a low population density.

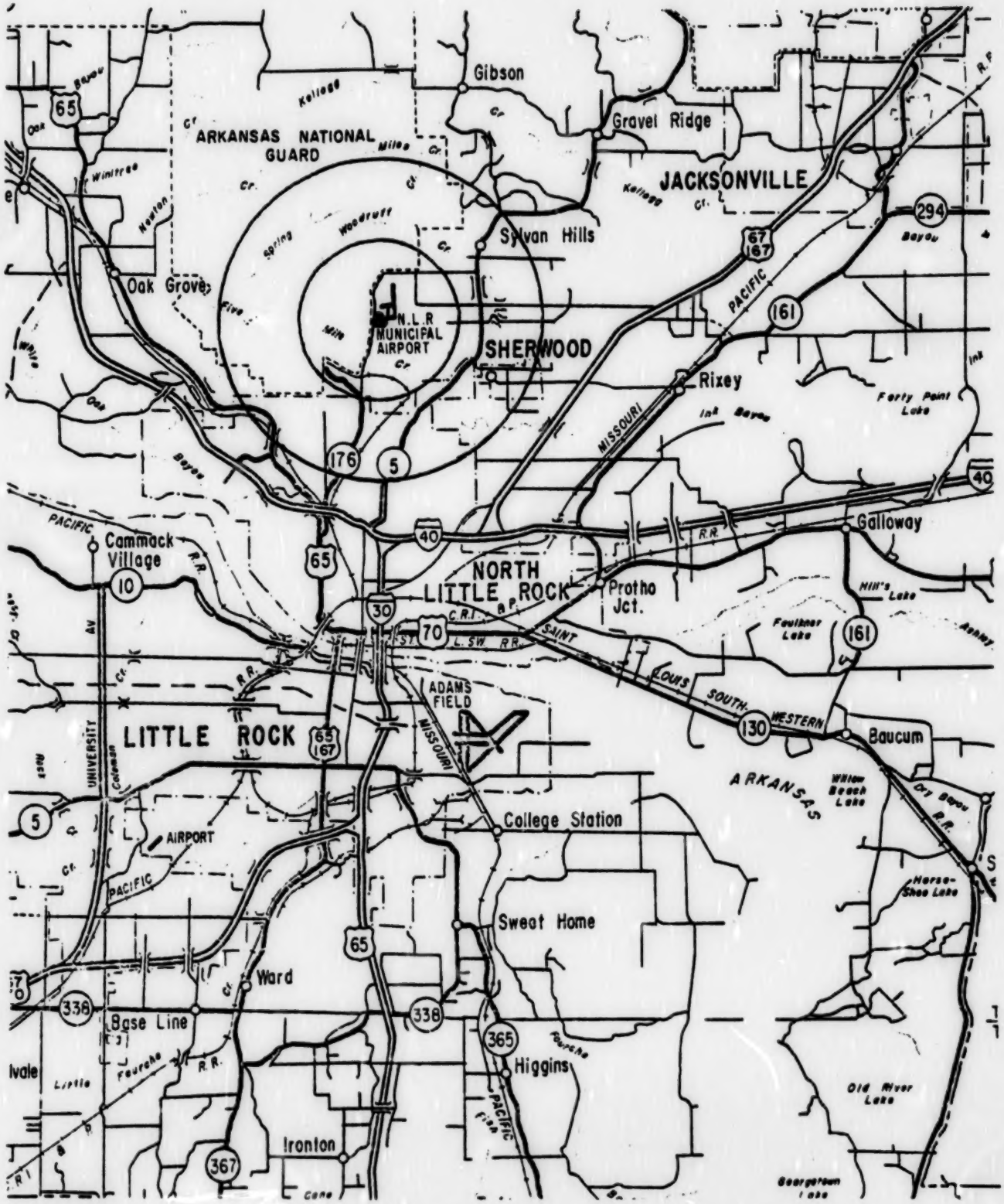

Figure 4-1. Location of Little Rock Monitoring Site.

5.0 DATA PRESENTATION AND SUMMARY

This section includes summaries of the data for the Little Rock metropolitan area. The data presentations indicate the variability of ozone and nitrogen oxides with respect to time.

All data channels were sampled once each second, and values recorded as five-minute arithematic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values. Inherent to any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for the NO_x analyzers and 2 ppb for the ozone analyzers. Therefore, any values appearing in the data presentations that are less than the threshold value indicate only a trace of the pollutant in question or random noise and should not be construed to be absolute levels. When the concentration levels drop below the lower threshold, the recorded quantity may be random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data were taken at the monitoring site in integer parts per billion (ppb) but are presented in micrograms/cubic meter ($\mu g/m^3$) assuming reference temperature and pressure of 25°C and 760 mmHg (1013.2 millebars), respectively.

Radian monitoring station number 010 was delivered to the Little Rock metropolitan site on July 2, 1977, but adequate power was not available until much later. Initial air conditioner problems also delayed the start of monitoring. After power was

acquired, the station was activated and allowed to stabilize before a multi-point calibration was performed at the site. After it was confirmed that the system was operating correctly, official monitoring began at midnight July 23, 1977. The system continued to monitor for a sixty-day period until operations ceased on September 22, 1977.

Tables 5-1 through 5-6 summarize the quality assurance results for the NO_x and ozone analyzers. The audit results are divided into three classes: (1) EPA audits, (2) external Radian audits, and (3) internal Radian audits. This classification allows comparisons between auditing groups and techniques. These results show that the two analyzers were operating within the specified limits for the full duration of the monitoring period. Therefore, no data were lost due to inaccuracies in the analysers. When the mid-term multi-point calibration was performed August 21, 1977, the analyzers were reading close enough to the correct value that no adjustments were made. On September 13, 1977, another multi-point audit/calibration was performed. The adjustments at this time were slight.

Figures 5-1 through 5-3 also verify the reliability of the analyzers during the monitoring period. These figures graph the daily span values for NO_x, NO and ozone. There was a noticeable downward drift in the response of the ozone span between August 19 and August 29 (Figure 5-3), but the results were still well within acceptable data limits. Inspection revealed that the analyzer was functioning correctly, but that the internal ozone source was deteriorating. The ozone generator was replaced and corrected this problem which did not affect data accuracy. These graphs also indicate the multi-point calibrations on September 13 at which time minor adjustments were made to the analyzers and the flows and span values from the span sources were re-verified. The daily span values for both analyzers were well within acceptable performance limits through the monitoring period.

Three hours of data were lost during the monitoring program due to two power failures caused by severe thunder storms. The first power failure on July 24 resulted in a loss of two hours of data. The second power failure on September 6 was of sufficient duration that one hour was lost because not enough samples were taken to give a statistical average.

All data collected during the monitoring period were valid data as indicated by the calibration and audit results. No deletions were made for any reason other than power failures. Therefore, 99.8% valid data recovery was achieved.

Table 5-7 gives the average concentrations of the pollutants during the course of the contract and for the month of August. Averages for the duration of the monitoring period rather than a series of monthly averages were computed because of the length of the monitoring assignment. August was the only calendar month for which monitoring was complete and a monthly average could be computed. It would not be statistically accurate to compute monthly averages for the portions of the other calendar months in which monitoring occurred.

The five largest one-hour concentrations are presented for each pollutant in Table 5-8. These values are based on clock-hour averages and not independent sliding averages. The table shows the one-hour period covered by the average.

Tables 5-9 through 5-12 demonstrate the diurnal variation of each of the recorded pollutants. Figures 5-4, 5-5, and 5-6 graphically represent the diurnal variations for August. Hourly averages were determined by arithmetically averaging five-minute samples. To insure statistical significance and to reduce the possibility of introducing a bias in the presentation,

averages were computed only when at least 50 percent of the samples were present. A blank entry indicates an insufficient number of five-minute samples present for that hour. The number of samples present for a particular channel is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time.

TABLE 5-1

EPA AUDIT RESULTS FOR NO AND NO_x CHANNELS

LITTLE ROCK, ARKANSAS

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/27/77	0.412	0.427	0.399	+3.6	- 3.2
	0.295	0.302	0.282	+2.4	- 4.4
	0.177	0.174	0.165	-1.7	- 6.8
	0.119	0.111	0.106	-6.7	-10.9
8/16/77	0.412	0.384	0.411	- 6.8	+0.2
	0.254	0.234	0.255	- 7.9	+0.4
	0.172	0.160	0.176	- 7.0	+2.3
	0.106	0.095	0.108	-10.4	+1.9

TABLE 5-2
EPA AUDIT RESULTS FOR OZONE
LITTLE ROCK, ARKANSAS

Date	Standard ppm	Indicated ppm	Percent Difference
7/27/77	0.336	0.297	-11.6
	0.246	0.222	- 9.8
	0.155	0.140	- 9.7
	0.110	0.103	- 6.4
8/16/77	0.370	0.335	- 9.5
	0.281	0.249	-11.4
	0.191	0.165	-13.6
	0.102	0.094	- 7.8

TABLE 5-3

RADIAN EXTERNAL AUDITS ON NO_x AND NO CHANNELS

LITTLE ROCK, ARKANSAS

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/25/77	0.282	0.265	0.264	-6.0	-6.4
	0.144	0.134	0.133	-6.9	-7.6
8/04/77	0.422	0.407	0.390	-3.6	-7.6
	0.320	0.310	0.300	-3.1	-6.3
	0.271	0.255	0.250	-5.9	-7.7
	0.183	0.178	0.169	-2.7	-7.6
8/11/77	0.443	0.440	0.434	-0.7	-2.0
	0.336	0.327	0.324	-2.7	-3.6
	0.236	0.230	0.230	-2.5	-2.5
	0.146	0.141	0.141	-3.4	-3.4
9/02/77	0.445	0.416	0.402	-6.5	-9.7
	0.220	0.208	0.199	-5.5	-9.5
9/06/77	0.364	0.361	0.350	-0.8	-3.8
	0.221	0.220	0.210	-0.5	-5.0
	0.171	0.168	0.164	-1.8	-4.1
9/14/77	0.416	0.418	0.398	+0.5	-4.3
	0.364	0.367	0.348	+0.8	-4.4
	0.221	0.218	0.211	-1.4	-4.5
	0.171	0.170	0.161	-0.6	-5.9
9/21/77	0.358	0.370	0.359	+3.4	+0.3
	0.212	0.212	0.208	0	-1.9
	0.169	0.170	0.164	+0.6	-3.0

TABLE 5-4

RADIAN EXTERNAL AUDITS ON OZONE

LITTLE ROCK, ARKANSAS

Date	Standard ppm	Indicated ppm	Percent Difference
7/25/77	0.308	0.328	+7.2
	0.139	0.149	+6.5
8/04/77	0.342	0.332	-4.5
	0.253	0.245	-3.2
	0.132	0.128	-2.9
8/11/77	0.342	0.359	+5.0
	0.253	0.253	0
	0.206	0.197	-4.4
	0.132	0.139	+5.3
9/02/77	0.408	0.412	+2.86
	0.140	0.144	+0.98
9/06/77	0.315	0.293	-7.0
	0.264	0.245	-7.2
	0.210	0.195	-7.1
	0.164	0.151	-7.9
9/14/77	0.315	0.319	+1.3
	0.264	0.259	-1.9
	0.210	0.204	-2.9
	0.164	0.154	-6.1
	0.102	0.097	-4.9
9/21/77	0.324	0.332	+2.5
	0.264	0.272	+3.0
	0.220	0.230	+4.5
	0.164	0.173	+5.5
	0.116	0.111	-4.3

TABLE 5-5

RADIAN INTERNAL AUDITS ON NO_x AND NO CHANNELS

LITTLE ROCK, ARKANSAS

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
7/22/77	0.390	0.391	0.382	+10.3	- 2.1
	0.321	0.322	0.323	+ 0.3	+ 0.6
	0.225	0.224	0.219	- 0.4	- 2.7
7/23/77	0.427	0.423	0.422	- 0.9	- 1.1
	0.367	0.366	0.372	- 0.3	+ 1.4
	0.316	0.314	0.320	- 0.6	+ 1.3
	0.272	0.267	0.270	- 1.8	- 0.7
	0.182	0.183	0.183	+ 0.6	- 0.6
	0.130	0.135	0.132	+ 3.9	- 1.5
8/05/77	0.422	0.407	0.390	- 3.6	- 7.6
	0.372	0.357	0.345	- 4.0	- 7.3
	0.320	0.310	0.300	- 3.1	- 6.3
	0.271	0.255	0.250	- 5.9	- 7.8
	0.225	0.206	0.199	- 8.4	-11.6
	0.183	0.178	0.169	- 2.7	- 8.7
8/21/77	0.390	0.382	0.371	- 2.3	- 4.9
	0.336	0.330	0.323	- 1.8	- 3.9
	0.284	0.278	0.272	- 2.1	- 4.2
	0.193	0.184	0.181	- 5.2	- 6.2
	0.145	0.134	0.134	- 7.6	- 7.6
8/31/77	0.440	0.431	0.424	- 2.1	- 3.6
	0.336	0.323	0.319	- 3.9	- 5.1
	0.236	0.227	0.225	- 3.8	- 4.7
	0.145	0.134	0.134	- 7.6	- 7.6

Table 5-5 (Continued)

Date	Standard ppm NO	Indicated ppm NO_x	Indicated ppm NO	Percent Difference NO_x	Percent Difference NO
9/03/77	0.440	0.434	0.427	- 1.4	- 3.0
	0.333	0.326	0.322	- 2.1	- 3.3
	0.234	0.225	0.226	- 3.9	- 3.4
	0.145	0.137	0.139	- 5.5	- 4.1
9/12/77	0.422	0.410	0.401	- 2.8	- 5.0
	0.320	0.310	0.305	- 3.1	- 4.7
	0.180	0.170	0.170	- 7.1	- 7.1
9/12/77	0.422	0.415	0.415	- 1.7	- 1.7
	0.320	0.315	0.315	- 1.6	- 1.6
	0.183	0.180	0.177	- 1.6	- 3.3
	0.139	0.137	0.133	- 1.4	- 4.3
9/19/77	0.422	0.418	0.418	- 1.0	- 1.0
	0.320	0.313	0.310	- 2.2	- 3.1
	0.183	0.177	0.179	- 3.3	- 2.2
	0.139	0.133	0.135	- 4.3	- 2.9

TABLE 5-6

RADIAN INTERNAL OZONE AUDITS

LITTLE ROCK, ARKANSAS

Date	Standard ppm	Indicated ppm	Percent Difference
7/22/77	0.403	0.409	+1.5
	0.292	0.306	+4.8
	0.202	0.205	+1.5
	0.141	0.140	-0.7
7/27/77	0.410	0.433	+5.6
	0.294	0.296	+0.7
	0.170	0.173	+1.8
8/05/77	0.410	0.430	+4.9
	0.294	0.293	-0.3
	0.170	0.169	-0.6
8/31/77	0.410	0.417	+1.7
	0.294	0.285	-3.1
	0.170	0.167	-1.8
9/12/77	0.440	0.414	-5.9
	0.295	0.282	-4.4
	0.173	0.165	-4.6
9/12/77	0.440	0.440	0
	0.295	0.307	+4.7
	0.173	0.174	+0.6
9/19/77	0.440	0.430	-2.7
	0.295	0.291	-1.4
	0.173	0.173	0

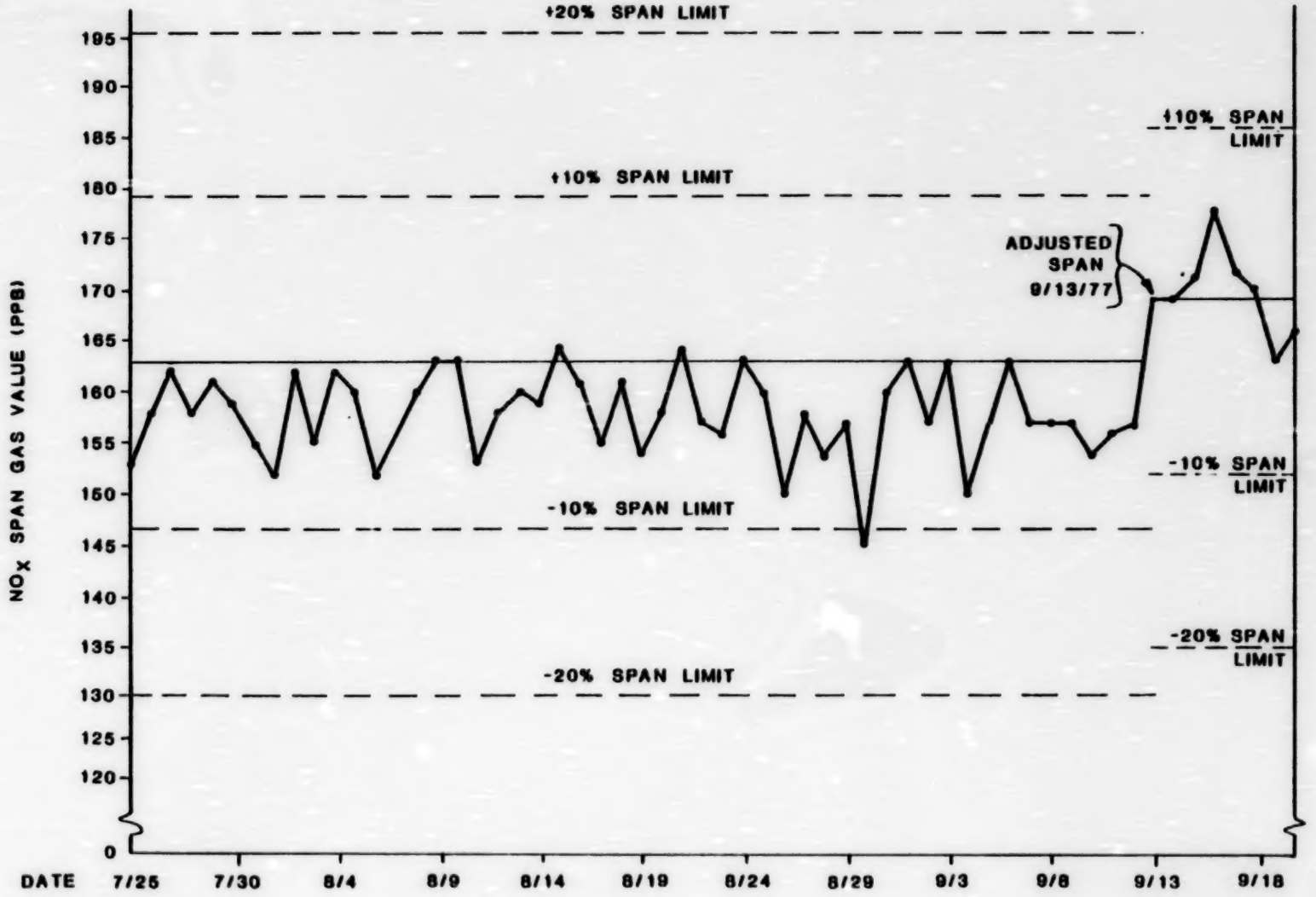

Figure 5-1. Daily NO_x Span Values, Little Rock, Arkansas

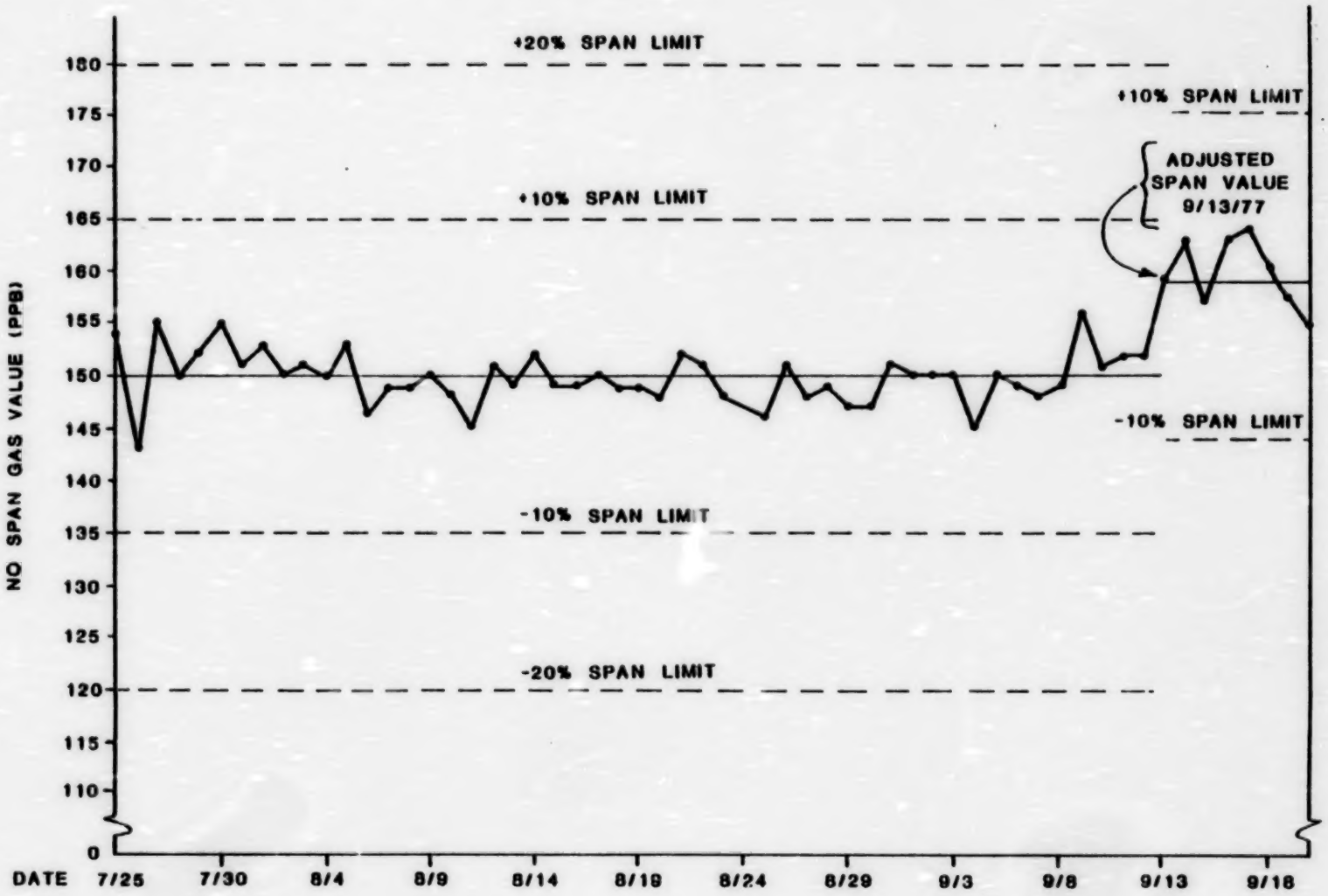

Figure 5-2. Daily NO Span Values, Little Rock, Arkansas

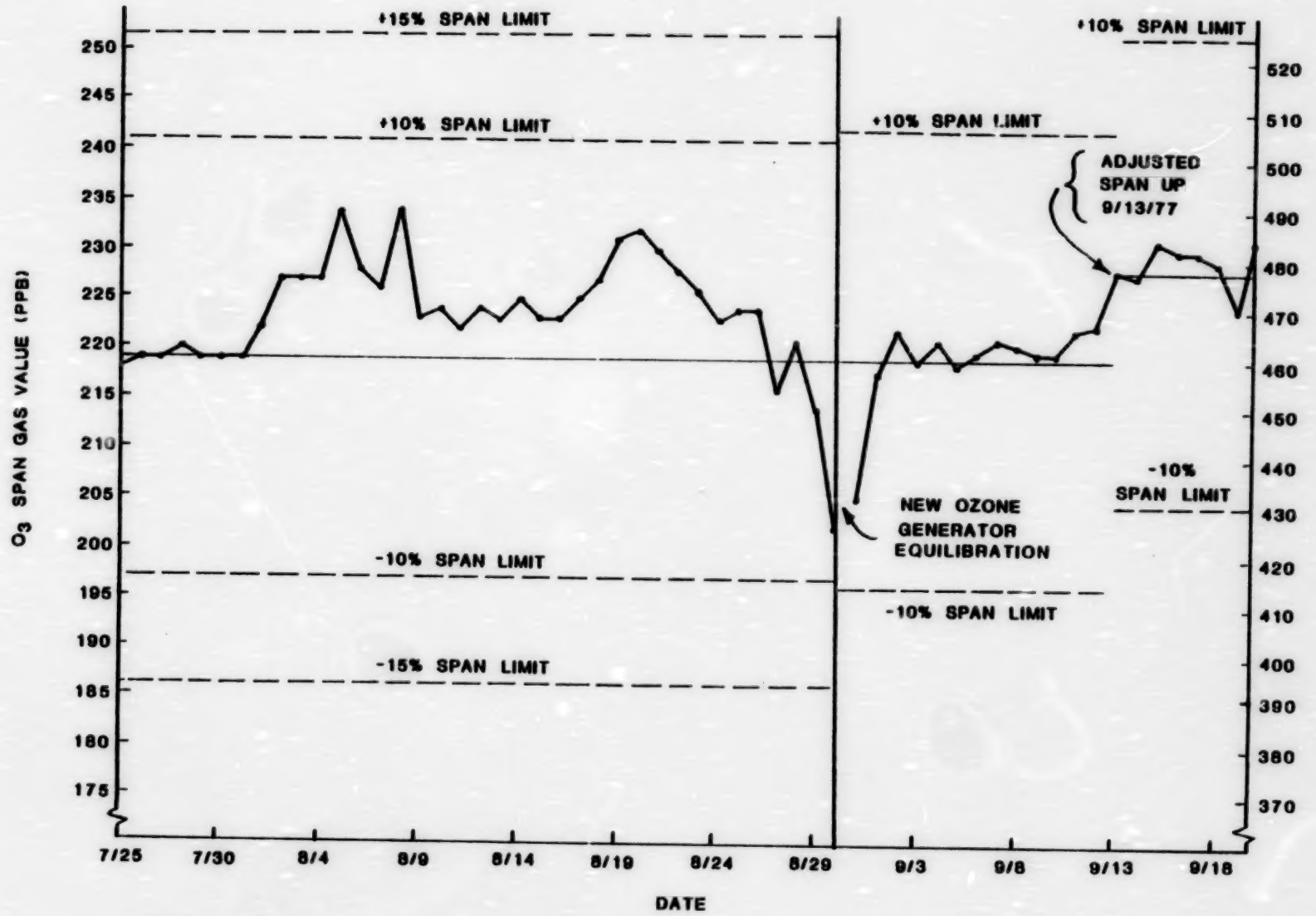

Figure 5-3. Daily Ozone Span Values, Little Rock, Arkansas

TABLE 5-7

SIXTY-DAY AND MONTHLY AVERAGES

LITTLE ROCK, ARKANSAS

Averaging Period	Nitrogen Oxides NO_x	Nitric Oxide NO	Nitrogen Dioxide NO_2	Ozone O_3
July 23 - Sept 21	2.9	0.4	2.5	89.3
Aug 1 - Aug 31	3.7	0.5	3.2	87.0

1.) All concentrations are expressed as micrograms per cubic meter ($\mu g/m^3$).

2.) The 60-day period (July 23 - Sept 21) constitutes the duration of the monitoring program.

TABLE 5-8

MAXIMUM ONE-HOUR AVERAGES FOR JULY 23 - SEPTEMBER 21

LITTLE ROCK, ARKANSAS

(Concentrations: Micrograms per Cubic Meter)

Nitrogen Oxides		Nitric Oxide	
1.)	8/21/77 (0400-0500) - 131	1.)	8/07/77 (0000-0100) - 56
2.)	8/07/77 (0000-0100) - 107	2.)	8/21/77 (0400-0500) - 54
3.)	8/06/77 (2300-0000) - 92	3.)	8/06/77 (2300-0000) - 38
4.)	9/09/77 (0900-1000) - 87	4.)	9/09/77 (0900-1000) - 34
5.)	8/06/77 (2200-2300) - 82	5.)	9/09/77 (1000-1100) - 34

Nitrogen Dioxide		Ozone	
1.)	8/21/77 (0400-0500) - 77	1.)	8/03/77 (1300-1400) - 314
2.)	8/23/77 (2200-2300) - 61	2.)	8/03/77 (1400-1500) - 293
3.)	8/23/77 (2300-0000) - 61	3.)	8/03/77 (1500-1600) - 272
4.)	9/15/77 (2100-2200) - 56	4.)	9/08/77 (1500-1600) - 260
5.)	8/21/77 (0300-0400) - 55	5.)	7/25/77 (1500-1600) - 252

TABLE 5-9

DIURNAL VARIATION OF NITROGEN OXIDES (NO_x)
JULY 23 - SEPTEMBER 21
LITTLE ROCK, ARKANSAS

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 10 PERIOD (7/23/77 TO 7/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
23	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0:	:	:	:	0	11	4	0	0	1
24	0	13	5	2	0	0	0	0	0	0	0	:	:	:	10:	0:	0:			39	50	4	0	0	7
25	0	0	0	0:	0	0	0	0	:	0	0:	:	:	:	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	:	:	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
30	0	1	36	41:	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	6	1	3
31	7	3	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	1	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	7	1	0	0	

TOTAL NUMBER OF OBSERVATIONS = 2260. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 10 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	0	0	0	0	:	:	0:	0	0	0	0	0	0	0	0	3	11	22	1
2	4	0	0	0	0	0	0	0	0:	8:	9	3	0	0	0	0	0	0	0	2	14	16	29	27	4
3	18	29	9	0	0	0	0	4	0	26	29	5	0	8	3	1	0	0	2	17	22	21	18	14	9
4	18	10	6	11	23	27	3	37	71	16	8	0	0	0	0	0	0	0	0	:	3:	5	2	0	10
5	0	0	0	0	0	0	0	4	3	1	0	0:	:	:	:	0	0:	0:	0	0	4	16	0	0	1
6	5	6	23	10	0	0	0	1	8	2	0:	0	0	0	0	0	0	0	0	0	18	41	82	92	12
7	107	59	3	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	20	2	9
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	38	30	44	5
9	30	10	13	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	19	4
10	22	1	0	0:	0	0	0	0	23	3	0	0	0	0	0	0	0	0	0	0	1	1	7	6	2
11	4	0	0	0:	0	0	0	1	:	:	:	:	0	0	0	0	0	0	0	0	0	4	1	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0
14	0	0	0	0:	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0:	0	0	6	7	6	14	6	0	0	0	0	0	0	0	0	0	4	24	17	24	4
16	5	0	0	1:	0	0	0	0	0	0:	:	0	0:	:	:	:	:	:	0	0	0	2	0	0	0
17	0	0	0	0:	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	3	64:	131	18	23	53	41	11	4	0	0	0:	:	4:	:	:	:	0	14	12	13	9	19
22	20	27	1	0:	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
23	6	0	1	4:	14	12	17	54	68	28	5	0	0	0	0	0	0	0	0	15	6	7	64	64	15
24	14	0	0	0:	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	4	6	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	12	1
29	8	6	0	0:	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	4	0	0	0	0	0:	0:	0	0	0	0	0	7	6	3	1	1
31	2	6	8	0:	0	0	0	10	33	12	0	0	0	0	:	:	0:	0	0	0	7	14	3	0	4
MEAN	8	5	2	3	5	1	1	6	9	4	2	0	0	0	0	0	0	0	0	1	3	8	10	11	

TOTAL NUMBER OF OBSERVATIONS = 8454. MEAN = 4.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN OXIDES (UG/M**3)

TRAILER NO. - 10 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	7	15	1	0	:	0:	0	0	0	0	0	0	0	5	11	2	0	0	2
2	0	0	0	0:	0	0	1	14	0	0	0	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0:	0	0	0:		:	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
8	5	20	26	5:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	2	4	8	3
9	5	20	26	5:	0	0	0	7	63	87	12	2	0	0	0	0	0	0	0	4	5	22	15	4	12
10	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	14	19	:	:	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0:	0	0	4	2	7	0	0	0	0	0	0	0	0	3	12	7	0	0	0	0	1
14	0	0	0	3:	0	2	2	2	2	0	:	0:	0	:	:	2:	3	3	4	3	4	3	4	0	2
15	0	0	0	0:	0	0	0	8	14	4	0	0	0	0	0	0	0	0	2	12	53	56	38	28	9
16	21	24	13	0:	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	9	10	2	3	0	3
17	0	0	0	0:	0	0	0	1	16	1	0	0	0	0	0	0	0	0	0	13	26	28	2	0	3
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	10	13	15	2	2
19	1	10	3	:	0	0	0	0	:	0	0	0	0	:	0:	0	0	0	0	3	0	0	0	0	1
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	0	0	0
21	0	0	0	0:	0	0	0	:	:																0
MEAN	1	3	3	0	0	0	0	2	6	6	0	0	0	0	0	0	0	0	1	3	6	6	4	2	

TOTAL NUMBER OF OBSERVATIONS = 5474. MEAN = 2.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-10

DIURNAL VARIATION OF NITRIC OXIDE (NO)
JULY 23 - SEPTEMBER 21
LITTLE ROCK, ARKANSAS

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

TRAILER NO. - 10 PERIOD (7/23/77 TO 7/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
23	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0:	:	:	:	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	:	:	:	0:	0:	0:			0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	:	0	0:	:	:	:	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	:	:	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	14	16:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
31	3	1	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TOTAL NUMBER OF OBSERVATIONS = 2260. MEAN = 0.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

TRAILER NO. - 10 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	0	0	0	0	:	:	0:	0	0	0	0	0	0	0	0	0	0	10	0
2	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	12	20	1	0	0	0	0	0	0	0	0	0	:	0:	0	0	0	1
5	0	0	0	0	0	0	0	0	0	0	0	0:	:	:	:	0	0:	0:	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	6	29	38	3
7	56	25	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
9	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	:	:	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0:	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0:	0	0	0	0	0	0:	:	0	0:	:	:	:	:	:	0	0	0	0	0	0	0
17	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	8:	54	0	0	2	3	0	0	0	0	0:	:	0:	:	:	:	0	0	0	0	0	3
22	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0:	0	0	5	26	31	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
24	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0:	0	0	0	3	12	2	0	0	0	0	:	:	0:	0	0	0	0	0	0	0	0
MEAN	1	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	

TOTAL NUMBER OF OBSERVATIONS = 8454. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITRIC OXIDE (UG/M**3)

(TRAILER NO. - 10 PERIOD (9/1/77 TO 9/21/77)

	HOUR																								
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	0	0	0	0:	0	0	1	10	0	0	:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0:	0	0	0	7	0	0	0	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0:	0	0	0:		:	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0:	0	0	0	4	34	34	0	0	0	0	0	0	0	0	0	0	0	6	2	0	3
10	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	2	2	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	0	0	:	0:	0	:	:	0:	0	0	0	0	0	0	0	0	0
15	0	0	0	0:	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
16	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0:	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	:	0	0	0	0	:	0	0	0	0	:	0:	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0:	0	0	0	:	:																0
MEAN	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TOTAL NUMBER OF OBSERVATIONS = 5474. MEAN = 0.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-11

DIURNAL VARIATION OF NITROGEN DIOXIDE (NO_2)
JULY 23 - SEPTEMBER 21
LITTLE ROCK, ARKANSAS

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 10 PERIOD (7/23/77 TO 7/31/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
23	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0:	:	:	:	0	11	4	0	0	1
24	0	13	5	2	0	0	0	0	0	0	0	:	:	:	10:	0:	0:			39	50	4	0	0	7
25	0	0	0	0:	0	0	0	0	:	0	0:	:	:	:	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	:	:	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
30	0	1	22	25:	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	6	1	2
31	4	2	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	7	1	0	0	

TOTAL NUMBER OF OBSERVATIONS = 2260. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 10 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	0	0	0	0	:	:	0:	0	0	0	0	0	0	0	0	3	11	12	1
2	4	0	0	0	0	0	0	0	0:	8:	9	3	0	0	0	0	0	0	0	2	14	16	29	27	4
3	16	29	9	0	0	0	0	4	0	24	28	5	0	8	3	1	0	0	2	17	22	21	18	14	9
4	18	10	6	11	23	27	3	24	50	15	8	0	0	0	0	0	0	0	0	:	3:	5	2	0	9
5	0	0	0	0	0	0	0	4	3	1	0	0:	:	:	:	0	0:	0:	0	0	4	16	0	0	1
6	5	6	23	10	0	0	0	1	8	2	0:	0	0	0	0	0	0	0	0	0	17	35	53	54	9
7	51	34	3	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	19	2	5
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	38	29	43	5
9	30	10	13	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	19	3
10	22	1	0	0:	0	0	0	0	23	3	0	0	0	0	0	0	0	0	0	0	1	1	7	6	2
11	4	0	0	0:	0	0	0	1	:	:	:	:	0	0	0	0	0	0	0	0	0	4	1	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0
14	0	0	0	0:	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0:	0	0	5	5	6	14	6	0	0	0	0	0	0	0	0	0	4	24	17	24	4
16	5	0	0	1:	0	0	0	0	0	0:	:	0	0:	:	:	:	:	:	0	0	0	2	0	0	0
17	0	0	0	0:	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	3	55:	77	18	23	51	38	11	4	0	0	0:	:	3:	:	:	:	0	14	12	13	9	16
22	20	27	1	0:	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
23	6	0	1	4:	14	12	12	27	36	25	5	0	0	0	0	0	0	0	0	15	6	7	61	61	12
24	14	0	0	0:	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	4	6	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	12	1
29	8	6	0	0:	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	4	0	0	0	0	0:	0:	0	0	0	0	0	7	6	3	1	1
31	2	6	8	0:	0	0	0	7	21	10	0	0	0	0	:	:	0:	0	0	0	7	14	3	0	3
MEAN	6	4	2	3	3	1	1	4	6	4	2	0	0	0	0	0	0	0	0	1	3	7	9	9	

TOTAL NUMBER OF OBSERVATIONS = 8454. MEAN = 3.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF NITROGEN DIOXIDE (UG/M**3)

TRAILER NO. - 10 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	0	0	0	0:	0	0	6	4	0	0	:	0:	0	0	0	0	0	0	0	5	11	2	0	0	1
2	0	0	0	0:	0	0	1	6	0	0	0	:	:	:	0:	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0:	0	0	0	0	0	0	0	0	:	:	:	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0:	0	0	0:		:	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
8	5	20	26	5:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	2	4	8	3
9	5	20	26	5:	0	0	0	3	29	52	11	2	0	0	0	0	0	0	0	4	5	15	12	4	8
10	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	12	17	:	:	0	0	0	0	0	0	0	0	0	0	0	0	1
13	0	0	0	0:	0	0	4	2	7	0	0	0	0	0	0	0	0	3	12	7	0	0	0	0	1
14	0	0	0	3:	0	2	2	2	2	0	:	0:	0	:	:	2:	3	3	4	3	4	3	4	0	2
15	0	0	0	0:	0	0	0	8	12	4	0	0	0	0	0	0	0	0	2	12	50	56	38	28	9
16	21	24	13	0:	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	9	10	2	3	0	3
17	0	0	0	0:	0	0	0	1	8	0	0	0	0	0	0	0	0	0	0	13	26	28	2	0	3
18	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	10	13	15	2	2
19	1	10	3	:	0	0	0	0	:	0	0	0	0	:	0:	0	0	0	0	3	0	0	0	0	0
20	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	0	0	0
21	0	0	0	0:	0	0	0	:	:																0
MEAN	1	3	3	0	0	0	0	1	4	4	0	0	0	0	0	0	0	0	1	3	6	6	4	2	

TOTAL NUMBER OF OBSERVATIONS = 5474. MEAN = 2.

: INDICATES CALIBRATION DURING THE HOUR

TABLE 5-12

DIURNAL VARIATION OF OZONE
JULY 23 - SEPTEMBER 21
LITTLE ROCK, ARKANSAS

DIURNAL VARIATION OF OZONE (UG/M**3)

TRAILER NO. - 10 PERIOD (7/23/77 TO 7/31/77)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
23	8	9	19	16:	14	14	4	0	1	33	64	71		:139	126	120	115	103	96:	58:	60	54	77	71	55
24	56	29	33	40	48	40	21	21	43	89	134	176:		:231	204	:	:			39	37	79	83	78	73
25	100	107	106	96:	92	75	70	63	:	99	135:	:		:216	:239	252	245	239	201	164	132	105	149	172	146
26	188	180	155	141:	124	127	121	126	102	71	70	86	98	108	116	112:	117:	113	106	98	89	75	72	74	111
27	72	72	79	106:	105	103	100	95	85	84	82	95	101	93:		:107:	108	105	125	116	100	93	91	93	96
28	91	99	123	134:	123	111	89	107	124	136	147	179	205	208	197	213	240	235	200	172	134	116	98	87	149
29	87	84	72	43:	27	25	47	64	89	130	142	:	:		:101	152	132	105	94	92	114	99	79	59	89
30	42	17	0	0:	1	6	29	45	87	109	155	223	184	138	98	102	105	110	97	91	56	50	19	11	75
31	6	15	28	34:	36	40	58	78	104	116	119	119	121	112	120	127	136	134	96	97	84	89	62	57	84
MEAN	72	68	68	65	63	60	60	67	79	96	115	133	142	150	150	153	151	143	129	104	90	84	81	78	

TOTAL NUMBER OF OBSERVATIONS = 2345. MEAN = 98.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF OZONE (UG/M**3)
TRAILER NO. - 10 PERIOD (8/1/77 TO 8/31/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	64	57	44	27:	49	67	60	48	56	67	72	86	102	115	114	113	123	142	131	115	79	49	40	36	78
2	38	41	50	39	51	92	73	73	79:	113:	128	148	180	187	186	187	187	177	149	131	98	90	69	59	110
3	70	49	66	87	91	95	90	78	105	141	187	235	231	314	293	272	216	147	134	105	84	82	88	89	140
4	75	75	72	59	45	45	83	38	50	130	173	210	234	244	184	171	:	:	142:	:	:	77:	73	66	112
5	61	63	62	54	47	45	53	43	38	50	79	104	121:	:	125	:	:	111	102	94	65	52	82	72	71
6	55	47	28	40	59	52	41	33	34	73	:	107	103	116	101	92	93	90	92	81	41	21	1	1	61
7	1	2	42	58:	53	44	48	52	67	92	103	123	154	165	134	121	113	102	87	71	45	14	6	21	72
8	38	65	72	75:	72	67	65	58	72	103	118	124	165	161	148	148	132	115	112	100	71	27	28	9	90
9	20	46	36	61:	66	73	62	55	68	97:	128	173	201	176	162	156	141	123	124	120	108	85	67	49	101
10	37	76	86	76:	63	51	44	47	46	86	128	138	127	166	141	121	134	162	143	108	81	77	62	62	94
11	61	63	60	:	55	51	49	40	53	84	120	157:	154	122	109:	:	:	:	116	96	77	57	60	70	81
12	61	56	50	:	50	33	35	32	47	49	75	97	120	122	123	117	114	99	98	81	49	50	54	54	72
13	64	68	74	:	59	45	43	46	43	55	78	102	115	109	104	106	101	97	86	68	36	31	46	60	71
14	42	29	28	:	44	43	29	25	48	83	122	148	146	171	179	175	166	129	97	82	76	76	70	75	91
15	55	43	36	:	13	5	0	6	22	42	81	136	117	104	136	221	186	115	92	93	51	12	17	3	69
16	8	8	2	:	6	13	17	20	24	35	:	:	:	134	166	166	152	120	102	79	62	47	44	47	62
17	58	67	94	:	104	89	50	73	101	99	100	102	101	100	96	101	111	110	105	91	84	82	79	82	90
18	78	78	84	:	74	72	67	64	76	104	128	138	141	136	138	143	143	148	149	134	117	112	108	92	110
19	89	92	88	:	79	69	66	62	59	62	75	107	145	161	154	147	144	144	133	106	74	57	78	86	99
20	78	47	74	:	69	79	50	52	92	121	146	166	182	188	183	170	178	166	144	122	90	78	80	70	114
21	61	47	51	:	0	39	23	9	43	100	137	178	196	209	215	236	223	173	145	121	72	63	58	52	106
22	36	17	42	45:	53	46	62	38	90	129	134	179	221	191	193	167	146	141	129	128	79	49	49	31	101
23	21	24	18	15:	6	12	16	8	13	33	58	111	132	141	134	130	125	158	138	89	64	43	6	8	64
24	39	62	67	67:	66	59	42	19	78	94	121	137	151	155	161	163	165	169	165	158	145	140	127	115	112
25	110	96	92	83:	81	75	65	62	72	94	122	156	191	190	172	167	157	161	170	151	119	118	123	100	123
26	92	89	92	71:	50	37	24	22	49	90	134	148	141	143	141	136	143	145	139	131	122	109	91	81	101
27	67	55	54	43:	34	27	22	22	34	57	75	85	81	83	87	89	85	83	69	65	71	63	64	60	62
28	52	40	40	28:	18	9	18	22	32	37	55	71	86	91	89	93	89	88	52	57	53	36	10	4	49
29	2	11	21	15:	10	14	16	14	19	34	47	55	66	88	96	96	92	89	81	65	53	55	56	57	49
30	57	54	48	40:	37	29	25	25	33	56	90	102	97	94	97	95	100	103	101	92	70	69	75	69	70
31	65	49	40	35:	30	22	18	11	26	62	86	87:	:	101:	:	100:	:	86:	90	78	54	37	46	49	53
MEAN	53	52	55	52	49	48	44	39	53	79	107	130	145	150	146	146	139	128	117	100	76	63	60	56	

TOTAL NUMBER OF OBSERVATIONS = 8454. MEAN = 87.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF OZONE (UG/M**3)

TRAILER NO. - 10 PERIOD (9/1/77 TO 9/21/77)

	HOUR																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
DAY																									
1	38	39	34	27:	18	7	1	12	53	86	:	92:	93	92	97	94	88	84	89	66	45	62	70	77	60
2	78	70	67	60:	55	47	33	20	78	110	143	161	153	:	164	171	171	167	157	139	120	92	118	130	110
3	124	128	122	131:	131	130	119	114	125	135	192	193	190	208	226	218	214	208	193	176	166	171	166	149	164
4	141	143	134	127:	125	119	116	109	118	143	140	140	150	158	161	155	150	147	134	115	105	86	64	43	126
5	44	38	36	43:	39	35	35	41	62	69	83	91	101	96	93	95	102	101	90	70	55	62	56	53	67
6	51	53	47	39:	35	34	36:		:	:	69	85	95	97	102	93	86	61	58	58	54	62	66	67	65
7	66	58	46	:	56	61	52	44	58	76	99	109	130	143	138	133	129	134	135	132	88	121	107	117	97
8	77	39	24	:	30	42	38	35	63	119	153	203	217	232	249	260	232	204	186	158	132	127	111	86	131
9	77	39	24	:	30	42	27	22	6	15	75	112	141	154	170	184	190	183	174	118	76	42	28	29	86
10	42	56	53	:	73	77	69	72	74	73	77	92	118	150	142	142	153:	148	153	126	107	110	107	111	101
11	103	98	99	:	96	85	85	82	84	79	104	135	149	161	176	166	156	149	143	118	96	89	93	79	114
12	66	57	58	:	55	44	34	16	13	44	84	152:		:172	194	195	178	154	142	126	106	103	92	101	99
13	123	118	107	:	76	66	48	32	20	24	32	66	80	81	91	91	94	76	53	50	85	63	67	81	71
14	66	47	38	:	31	23	28	27	27	37	38	44	42	:	67:	81	80	80	70	62	53	52	46	49	49
15	50	44	39	:	42	35	32	23	26	53	75	100	139	158	158	164	169	160	146	110	40	26	40	49	82
16	52	39	37	:	61	57	51	43	43	56	86	104	126	152	159	142	137	131	123	69	58	56	49	45	82
17	38	42	48	:	46	38	30	24	26	56	63	78	102	109	116	118	99	81	77	45	17	8	46	54	59
18	55	64	67	:	64	53	38	30	27	33	40	58	76	93	102	109	113	106	79	53	40	30	33	46	61
19	42	20	47	:	74	53	45	36	:	39	54	77	96	99	:	108	98	103	92	56	81	96	92	103	72
20	102	100	93	:	73	57	47	46	54	64	82	98	107	109	124	130	114	129	118	84	53	53	53	55	85
21	55	47	66	:	55	46	44	:	:																52
MEAN	71	64	61	71	60	55	48	44	53	69	89	109	121	137	146	142	138	130	121	97	79	75	75	76	

TOTAL NUMBER OF OBSERVATIONS = 5503. MEAN = 89.

: INDICATES CALIBRATION DURING THE HOUR

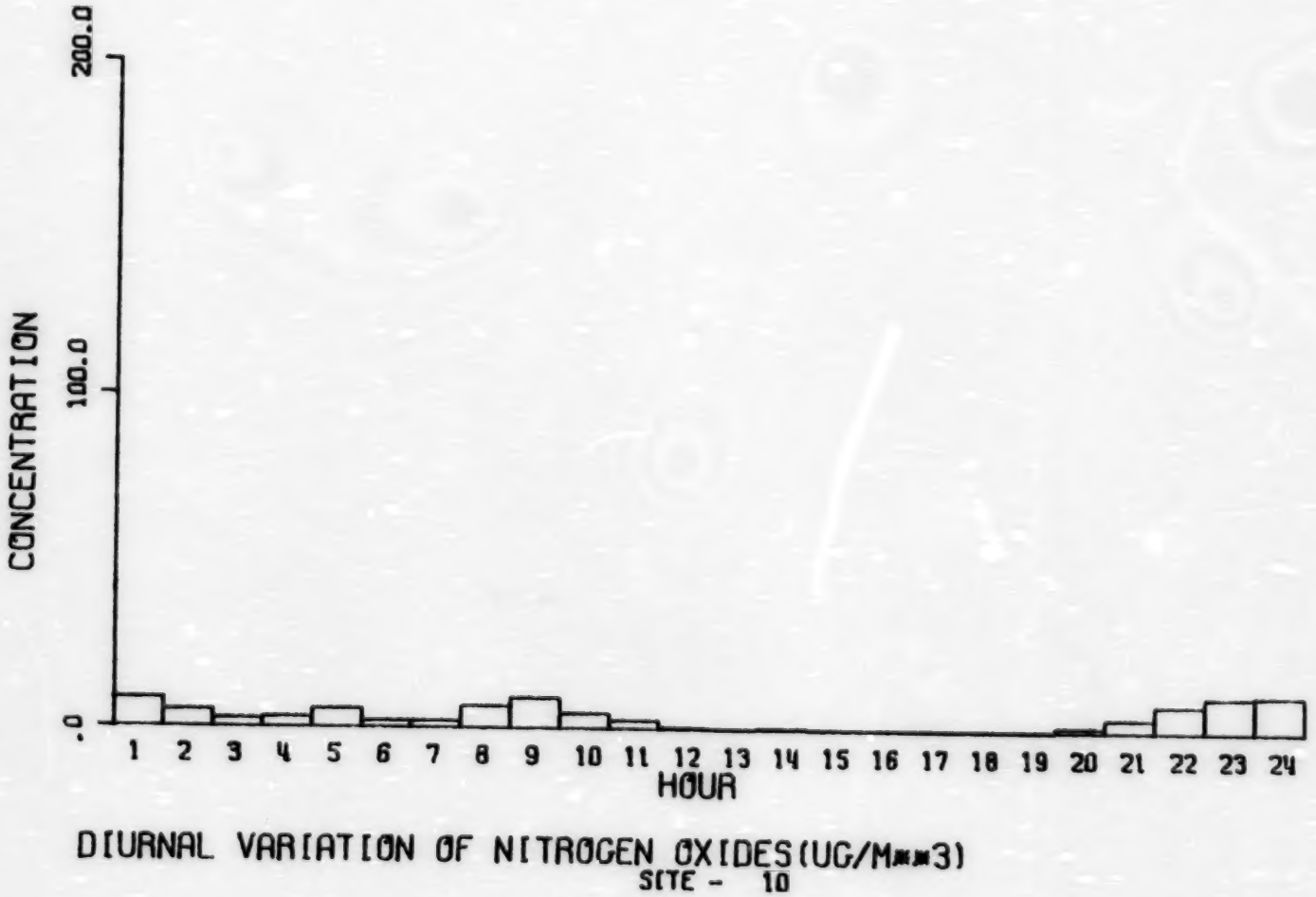
200.0
100.0
.0
CONCENTRATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITROGEN OXIDES(UG/M**3)
SITE - 10

Figure 5-4. Diurnal Variation of Nitrogen Oxides (NO_x)
August 1977, Little Rock, Arkansas

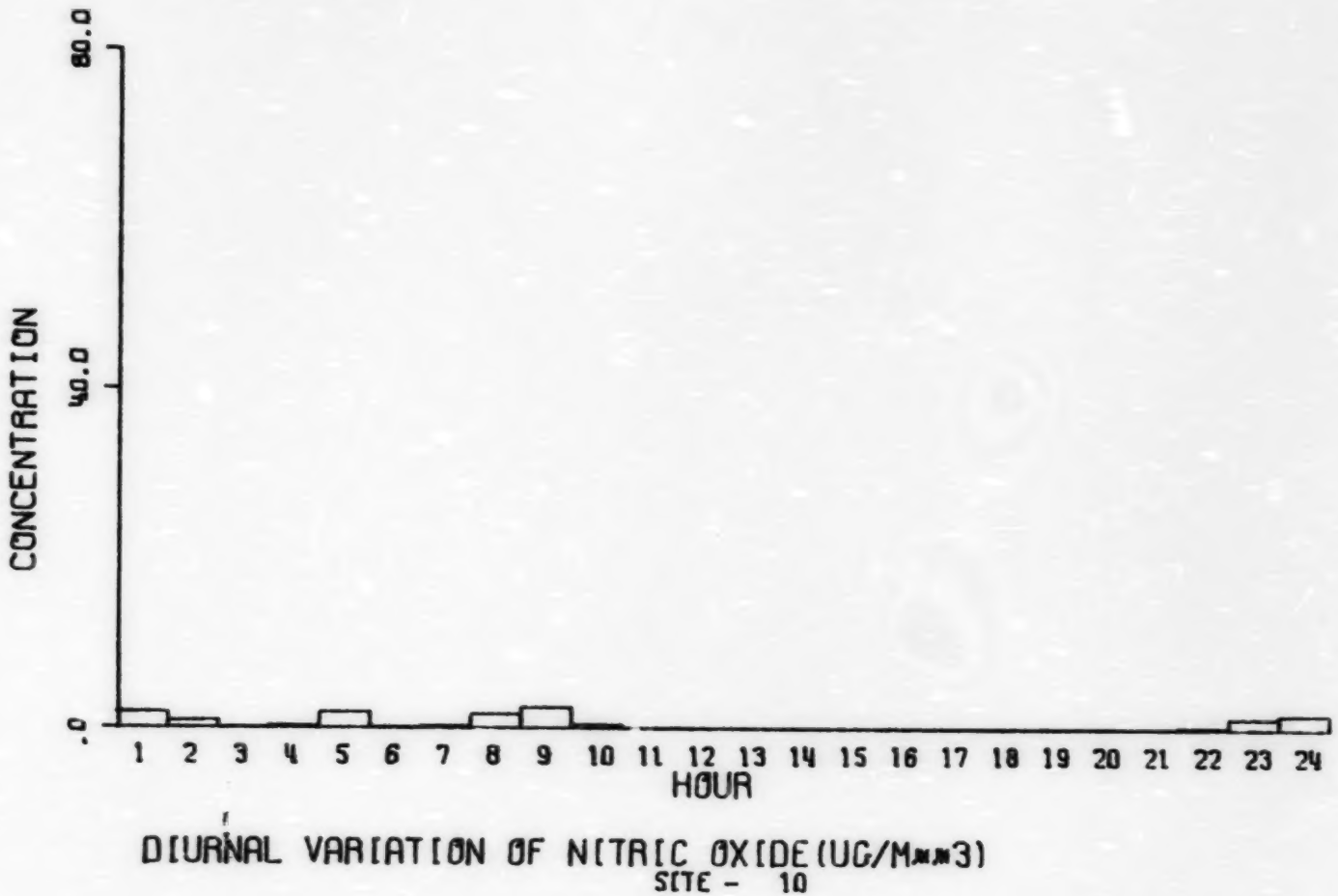
80.0
40.0
.0
CONCENTRATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITRIC OXIDE(UG/M**3)
SITE - 10

Figure 5-5. Diurnal Variation of Nitric Oxide (NO) August, 1977, Little Rock, Arkansas

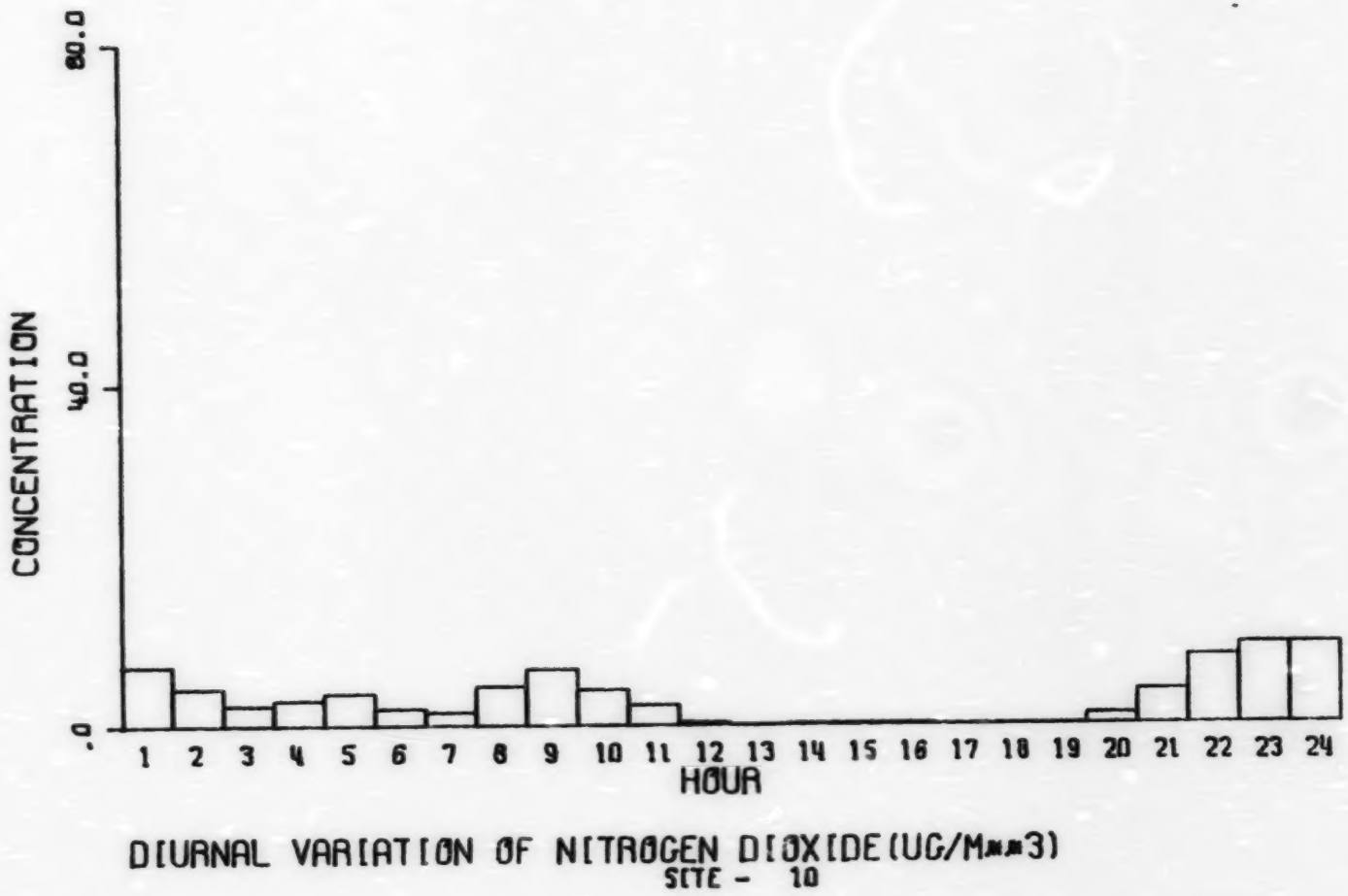
80.0
40.0
.0
CONCENTRATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HOUR
DIURNAL VARIATION OF NITROGEN DIOXIDE(UG/M**3)
SITE - 10

Figure 5-6. Diurnal Variation of Nitrogen Dioxide (NO_2)
August, 1977, Little Rock, Arkansas

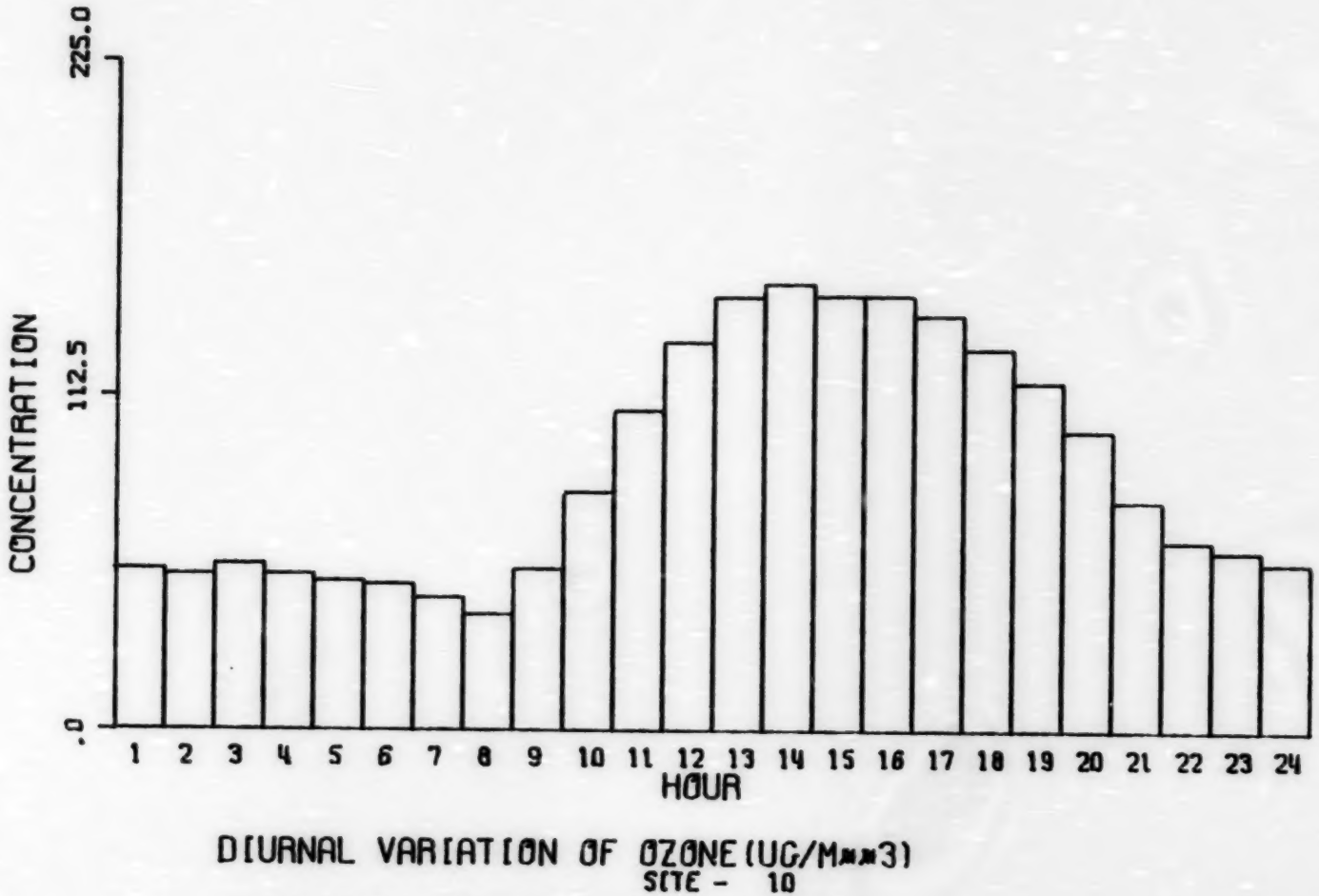

Figure 5-7. Diurnal Variation of Ozone
August, 1977